

This is an Accepted Manuscript of an article published by Taylor & Francis Group in the *Development in Practice* on 07 May 2013, available online at <http://www.tandfonline.com/doi/abs/10.1080/09614524.2013.781128>.

Assessing food insecurity in Botswana: the case of Gaborone

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Abstract

The search for appropriate tools to assess food and nutrition insecurity is a major preoccupation for development practitioners. This paper explores the potential of complementing a mainstream measure of food security, the Household Dietary Diversity Score (HDDS) with a political ecology approach, using a case study from Gaborone, Botswana. HDDS exposes differential food access, illustrated by varying household dietary diversity scores and commonly accessed food groups, while a political ecology approach helps explain how and why households lack access to certain food groups. HDDS enriched with political ecology analysis will provide more useful conclusions to practitioners and policy makers.

Keywords: Food security; Dietary diversity; Political ecology; Urban; Botswana

Introduction

When the issue of food security recently caught global media attention in April 2008, researchers and analysts reported that poor urban dwellers would be most vulnerable to the food price and financial crises (Ruel et al., 2010). This is because these individuals are generally net food buyers who rely on income for their food security, spend large proportions of household budget on food, and have little access to other safety nets such as agriculture or land to ensure food access in times of crisis (Ruel et

al., 2010). The increasing vulnerability of urban dwellers is further compounded by rapid rates of urbanization globally. Even Africa, which has traditionally been considered mostly rural, is increasingly an urban continent, recording the highest average annual urban growth rate in the world of 3.3 per cent between 1990 and 2000 (Frayne et al., 2010). Urban food security in Africa is therefore an urgent development concern, however, there is limited theoretical and empirical investigation on factors generating urban food insecurity and political action to address them (Frayne et al., 2010).

Researchers, development agencies and governments are currently faced with the problem of assessing urban food security, developing relevant interventions and measuring intervention impact on households with varying levels of food insecurity. Several measures have been developed to accurately reflect how households access food (Webb et al., 2006). These measures often focus on gathering information about nutrition and socioeconomic welfare through simple, brief and low cost questionnaires or through more elaborate country surveys which involve more time, effort and expense. Household dietary diversity has proven popular as a measure of food security amongst practitioners because its data requirements are fairly easy to collect and analyse (Thorne-Lyman et al., 2010). Household dietary diversity score (HDDS) determines the number of different foodstuffs or food groups consumed over a given reference period, such as the last 24 or 48 hours or the last 7 or 14 days. Although the FAO and World Food Programme use different data collection methods and analytical strategies, both organisations use information on dietary diversity as a key element to inform food security analysis (Kennedy et al., 2010). HDDS has been validated in different countries as a proxy measure of household per capita energy intake and a tool for monitoring household economic access to food, dietary patterns and the consumption of specific foods (Kennedy et al., 2010).

A major limitation to the HDDS tool is that it lacks a universal cut-off point for defining varying levels of food security because variations in dietary patterns and food systems across countries and regions may impact the interpretations of dietary scores (Kennedy et al., 2010). Also the dietary diversity measure does not expose the context-specific causes of consumption deterioration, such as prices or self-production (FAO, 2009). Hence the FAO and Food and Nutrition Technical Assistance Project by USAID, strongly recommend that the HDDS measure should not be utilized as a stand-alone tool. Rather HDDS should be complemented with other food related evidence to obtain

a holistic representation of the food and nutrition security situation in a community (FAO, 2007). Political ecology offers one such complementary option. At its core, political ecology helps unravel the complex and interrelated political-economic, social-cultural, and ecological processes that shape highly uneven landscapes (Robbins, 2004). It can provide nuanced, contextualized evidence to establish the significance and meaning behind quantitative trends generated through HDDS. It can assist in ordering households along a continuum based on food insecurity levels as grounded in empirical household experiences (Webb et al., 2006). Combined with political ecology then, HDDS stands to more holistically and robustly identify factors influencing dietary scores, changes in dietary patterns and differential food access. As such, relevant decisions can be made on cut-off or target scores as well as appropriate interventions to improve food access hence improve households' macro- and micronutrients.

The objective of this paper is to combine HDDS with political ecology analysis as a means of generating robust and multi-faceted insights on urban food security. By doing so, the paper offers a methodological resource to guide researchers and practitioners, as well as to inform policy and programmatic planning in food security realms. The structure of the paper is as follows. First, it provides a brief methodological overview of the Gaborone, Botswana case study. Second, it reviews the use of HDDS as a food security indicator, and presents dietary diversity score findings from Gaborone. Third, it outlines the political ecology approach, and details empirically the political-economic, socio-cultural, and ecological processes found influencing food security in Gaborone. Fourth, it concludes with a discussion on how a combined HDDS and political ecology approach can advance both understanding of and interventions on food security in Botswana.

Methodology

Botswana presents an important site in which to explore urban food security in sub-Saharan Africa as it has experienced rapid urban growth since its independence with some 61 per cent of Botswana now urban residents (Central Statistics Office, 2011). This demographic shift is driven by a combination of recurrent droughts causing rural agricultural problems and urban opportunities, services and lifestyle emerging from huge private and public investments in Gaborone. Agriculture in Botswana is stagnant, with low domestic food grain production such that more than two-thirds of the

annual requirement is imported (Hovorka, 2004). The purchase of food in Gaborone is therefore inevitable, and the absence or scarcity of informal markets means that even low income urban residents are dependent on western standard supermarkets for food purchases. At the same time, a portion of the Batswana diet comes from wild and traditional food as well as through rural-urban remittances.

Gaborone, the capital city, remains the principal destination of many Batswana moving from rural areas and hosts the largest portion of the total nation population (186,007 or 11.07 per cent) (Central Statistics Office, 2011). Literature on food security in Gaborone is minimal, since the issue of food security within Botswana is generally associated with analysis of cumulative rainfalls, rural crop production and the timely arrival of cereal imports. There is limited agricultural production within the city and, as Hovorka (2004) notes, existing urban and peri-urban agriculture in the greater Gaborone area is a result of dynamic entrepreneurial endeavour rather than response to food crisis. People living in Gaborone generally obtain their food stuffs from several food access points including supermarkets, general provision stores (cash and carry), stores at filling stations, fast food chains, restaurants and street vendors (Frayne et al., 2010).

This study was design as an in-depth case study using a purposive sample in order to explain trends found in a broad statistically representative survey of HDDS in Gaborone, carried out by the African Food Security Urban Network (AFSUN). The AFSUN food security study in Gaborone, including 400 households totalling 1237 people, from three neighbourhoods, (Old Naledi, Broadhurst, White City/Bontleng), notes that food secured households had more diversified diets (Acquah, 2010). The case study presented in this paper goes further by engaging an in-depth mixed-methodology and engaging a complementary HDDS and political ecology assessment to document how and why households in Gaborone are food insecure. Although dietary diversity studies generally engage in quantitative techniques that emphasise statistically significant samples, this study aimed at interpreting the context of and providing more depth to dietary scores. Thus a smaller purposive sample (n=40) based on achieving qualitative saturation was used. We make no claim that data from our case study are representative of the wider population in Gaborone, nor does it provide an estimate of the rate of food insecurity in the city. Rather the case study offers a useful example for how a complementary HDDS and political ecology assessment could be operationalised in a particular context.

The sample was stratified based on household-head gender and socio-economic status because these subpopulations have been noted as particularly relevant in food security research. Specifically, the broad AFSUN research found gender along with income to be important variables in understanding urban food insecurity in Southern African cities (Frayne et al., 2010). Households were selected from Broadhurst, a vibrant urban residential, industrial and commercial area, which was developed from an agricultural holding previously known as Broadhurst Farms. According to the last official census of 2001 Broadhurst was home to about 28.9 per cent (53,677 people) of the city's total population of 186,007 (Central Statistics Office, 2011). Broadhurst was found to be very mixed in terms of hosting a wide range of people of diverse household structures and socio-economic status, thus suitable for this study. Using a street map of Broadhurst obtained from the department of surveys and mapping, Gaborone, Botswana, five residential blocks/neighbourhoods, known commonly in Gaborone as *extensions*, were randomly selected. From each extension, four streets were randomly selected. The process of theoretical sampling, which is typical of ethnographic studies, was used in the selection of households. That is in place of random sampling the entire street or neighbourhood; this approach identified appropriate households (e.g. low income/middle income, female headed/male headed households) and asked them to participate in the study. On each street, the first house was selected, if they declined to participate, the next house was selected, then the fourth, with a maximum of two households selected on each street. The data were collected with the help of a Setswana-speaking research assistant, who acted as cultural guide and translator in cases where respondents felt more comfortable speaking in their local language.

Households were classified into low or middle income categories based on a composite assessment of the material circumstance of the household, the occupation of household members, and their reported income. Low income houses had a pit latrines, were often in a state of structural degradation and they were often not linked to the city electric grid. The household head was employed part time or full time with a monthly income of less than P1500 (P=Botswana Pula). Middle income houses were linked to the city sewage system and city electric grid, often fenced around with electric gates or guard dogs for security. The household head was employed full time with a monthly income of more than P1500.

The information used to assess dietary diversity scores (see HDDS questionnaire: Appendix A) was collected using the previous 24-hour period as a

reference to ensure accuracy of information collected. The head of household or a delegated person willing and knowledgeable to do so completed the questionnaire. The characteristics of urban food practices, including consuming food out-of-home, easy-to-prepare and processed foods and snacking represent a significant portion of daily energy intake as such should be included when assessing urban dietary diversity (Becquey and Martin-Prevel, 2010). All types of foods consumed as part of daily energy intake from all source were recorded. Saturation was achieved while engaging with the sixth household in all the different strata, which were under investigation. At that point, in the research process, the range of arguments/information gathered was becoming recurrent. Food types consumed, consumption patterns, and reasons for food choice were similar and repetitive. Another four households in each category were selected to see if there would be any new trends and to ensure an adequate number of households in each category.

The heavy reliance on self-reporting presented an obvious limitation for this study and was addressed through data triangulation. For example, through repeat visits and discussions via telephone, participants were regularly engaged in the research process that sought to understand their diets. Unstructured discussions, observations, interviews, and secondary sources, generated empirical data essential to explore the context-specificity of urban diets that is the political ecology of urban diets. Collection of dietary diversity data was complemented with discussions with households about the factors that determined their dietary patterns. Observations were carried out for half an hour to four hours in a variety of settings including homes, grocery stores, restaurants and fast food eateries. To uncover peoples' interpretation of their food security situation it was useful to participate and engage in conversations with them while they prepared meals, ate or during their grocery shopping. Key informant interviews focused on Botswana's food security situation, policies and practices, urbanisation and dietary changes. Key informant interviews and several secondary sources including government publications and research papers were also exploited to contextualise dietary scores. Transcripts and field notes from interviews and discussions were read and coded for emerging themes, related to core political ecology issues (political-economic, social-cultural and ecological factors). To gain an in-depth understanding of these themes it was essential to draw upon and relate the emerging themes to those within food security and political ecology literature. This iterative process of analysing the emergent themes

from the data collected and relating it to reviewed literature exposed the ways in which core political ecology issues shaped dietary diversity in Gaborone.

Using HDDS to measure urban food security

HDDS overview

In Southern Africa despite generally adequate city level food supply, households lack universal access to sufficient food, thus citizens tend to consume highly processed non-nutritive foods (Frayne et al., 2010). This results in what emerging urban food security literature highlights as the so-called ‘double burden’ of disease, where food insecurity and malnutrition co-exist with obesity, a situation, which is increasingly prevalent in low-income societies. While the poor lack the means to maintain their energy intake and dietary quality, wealthier households, substitute the loss of dietary quality by consuming excess energy (Ruel et al., 2010). It is therefore important to assess food insecurity by gauging what types of foodstuffs households have access to. HDDS has been suggested to be a useful indicator of food security as it has been shown to have strong association per capita consumption and energy availability, thus it exposes whether households have access to sufficient, safe and nutritious food to meet their dietary needs (Ruel, 2003).

Obtaining data for HDDS analysis is relatively straightforward. Field experience indicates that training field staff to obtain information on dietary diversity is not complicated, and that respondents find such questions relatively straightforward to answer, not especially intrusive/burdensome. Asking these questions typically takes less than 10 minutes per respondent (Swindale and Bilinsky, 2006). Swindale and Bilinsky (2006) suggests the use of a set of 12 food groups for the calculation of dietary diversity scores, based on an FAO Food Composition Table for Africa. They include (a) Cereals (b) Roots or tubers (c) Vegetables (d) Fruits (e) Meat, poultry and offal (f) Eggs (g) Fish/shellfish (h) Pulses/legumes/nuts (i) Milk and milk products (j) Oil/fat (k) Sugar/honey (l) Miscellaneous (Coffee/tea/condiments). The calculations involved in determining dietary scores are simple.

$$HDDS = \sum (a + b + c + d + e + f + g + h + i + j + k + l)$$

Values for *a* through *l* will be either zero “0” or one “1”, so HDDS will be a value between 0 and 12, which represent the total number of food groups consumed by members of the household. It has been proposed that target scores be established using the mean diversity of the 33 per cent of households with the highest diversity (Swindale and Bilinsky, 2006). It therefore follows that low dietary diversity (lower third) will be the mean diversity of the 33 per cent of the households with the lowest diversity, while the average is in between. This is useful for monitoring purposes as any increase in household dietary diversity reflects an improvement in the household diet (Swindale and Bilinsky, 2006), which can be observed as a move from the lowest third towards the highest. As mentioned earlier, since diets tend to be context-specific it is difficult to compare scores, thus it is difficult to establish what could be a universally accepted dietary diversity target scores from which broad-scale policies could be developed. This study will therefore focus on exposing the context-specific issues that enhance or limit access to certain food groups rather than seek to establish statistical levels of food insecurity.

HDDS in Gaborone

As noted above the case study sample consisted of 40 households. Twenty (20) were low income further stratified into 10 male and 10 per cent female headed household, and 20 were middle income also further stratified into 10 male and 10 female headed household. The mean household size was 4.4, with the smallest households having just one member and the largest having eight members. The mean age of the household head was 44.8, with the youngest being 20 and the oldest being 65. Some 20 per cent of the household heads had no formal education, 50 per cent had primary education, while 10 per cent and 20 per cent had secondary and tertiary education respectively. Most household heads had some form of full time employment (70 per cent), while 15 per cent reported being employed on part time basis, and 5 per cent were unemployed (and on government aid), pensioners or students. The mean household monthly expenditure on food was P569.25, with the minimum noted at P150 and the Maximum P2000. All 40 household purchased foodstuffs mainly from the supermarkets, with 65 per cent of them obtaining some foodstuffs from relatives in the rural areas, while 10 per cent engage in some form of urban or peri-urban agriculture.

The broader AFSUN survey found that HDDS was higher in food secured households with the difference between the HDDS scores in food secured and insecure households, statistically significant ($p < 0.001$, $\eta^2 = 0.399$). More diversified diet also highly correlates with household income, with the median score for low income (income < 850 BWP) households was found to be 5 while the median score of higher income (income > 1900 BWP) households found to be 8. Though median score for the entire sample was high, 7, when non-nutritive food items such as sugar and beverages were removed from the dietary intake of the sample, the dietary diversity score dropped to three (Acquah, 2010). In terms of gender of household head, there was no statistically significantly relation between HDDS and gender of household head and only minor difference in the average HDDS (HDDS of male head households = 6.25 and HDDS of female headed household = 6.75). In terms of the specific food groups that people consumed, foods from grains were noted as the most frequently consumed at 97.2 per cent, followed by sugar/honey at 73 per cent, beef, poultry and offal at 66.5 per cent while fish/shellfish was the least consumed at 12.8 per cent followed by eggs at 23.6 per cent and beans, peas, lentils or nuts at 27.4 per cent.

The results of our case study reflect similar HDDS trends of the larger AFSUN Gaborone sample. Household dietary diversity scores, on 12 food groups, ranged from 4 to 12, with a mean score of 7. Low income households had dietary diversity scores ranging from 4 to 9, with a mean of 6, while middle income households had dietary diversity scores ranging from 4 to 12, with a mean of 8. Female headed households had dietary diversity scores ranging from 4 to 11 with a mean of 7, while male headed households had dietary diversity scores ranging from 4 to 12 with a mean of 7. In terms of a detailed analysis of how the different food groups scored amongst the 40 households cereals, sugar, oil and tea/coffee were consumed by more households while fish, pulse/legumes/nut, and eggs were amongst the least consumed foodstuffs. More middle-income households consumed eggs, meat/poultry/offal, fruits, and potatoes than low income households. In terms of gender, the consumption of potatoes was noticeably higher in male headed households, though it is worth noting that this was only true for middle income male headed households. Income was noted as a stronger determinant for potatoes consumption than gender.

The small sample size of this case study makes it appropriate to use linear correlation to test the significance in the relationship between dietary diversity score and socioeconomic indicators. There is clear difference in the mean HDDS when

comparing low income versus middle income households, yet there is no difference when comparing the mean HDDS of male versus female headed households. These analyses suggest that household dietary diversity assessment exhibits association with an often-used indicator of food security, namely household socioeconomic status. This case study is similar to previous studies suggesting strong correlation between dietary diversity and socio-economic status (Thorne-Lyman et al., 2010). Determining target scores can therefore present an appropriate avenue for policy makers to find out what portion of a population requires intervention and assess the impact of the intervention. There should be an observable improvement of people dietary diversity from the determined lowest third towards the highest third.

It is often noted that that poorer households' low dietary diversity is typified by low consumption of non-staples and proteins. In the case of Gaborone, drawing on both the larger survey and our case study, while this statement is true for foods like eggs, fruits and tubers (potatoes), it is not true for milk and milk products, oils/fats, sugar/honey, and tea/coffee. The fact that some non-nutritive food stuffs (oils/fats, sugar/honey, and tea/coffee), were often present in the HDDS score of low income household, could lead to misinterpretations of the high HDDS score for these households. That is, the tendency to equating the high scores to the fact that they are food secured. It is worth further unravelling why these foods were often present in households' diets. Also more than half (12) of the low income households reported that they had consumed some form of meat in the last 24 hours, while the consumption of fish was equally low for both low and middle income households. These discrepancies can only be resolved by seeking further information about the context within which these households obtain these varying dietary diversity scores. In the next section, we draw on political ecology as a useful framework to contextualize HDDS measures.

Using political ecology to contextualize urban food security

Political ecology overview

The field of political ecology encompasses research dating back to the late 1960s and early 1970s aimed at analysing the forces at work in ecological struggles while presenting livelihood alternatives in the face of change (Robbins, 2004). Political ecologists have sought to answer how and why environmental changes occur; who has access to resources and why; why conservation efforts fail and how political/economic

exclusion occurs; and who instigates political upheaval, where and how (Robbins, 2004). Political ecology has been described as an approach to the complex metabolism between nature and society (Robbins, 2004). That is, natural and social processes are interdependent and constantly changing in dynamic and unstable ways based on specific political, economic, social and culture context. We propose political ecology as an appropriate tool to complement the HDDS measure given its insightfulfulness on nature-society relationships. Indeed the relationship between humans and their food, that determines how much food humans consume and the nutritional quality of the food, is a central nature-society relationship (Heynen, 2006).

Most political ecology themes have been explored within agrarian societies in rainforest and savannas ecosystems, however, a more recent trend is the growing body of literature on urban nature or the political ecology of cities as seen through the work of amongst others Erik Swyngedouw (Swyngedouw, 2006) , and Nik Heynen (Heynen, 2006). While these studies still examine the dialectic relationship between nature and society, they have taken a specifically urban focus, dealing with issues of environmental injustice as seen through for instance urban hunger, water scarcity, energy or waste management. Urban political ecology provides detailed analysis of the “dense networks of interwoven socio-ecological processes that are simultaneously human and physical, discursive, cultural, material and organic” within cities (Swyngedouw, 2006 :21). Emphasis is not on the city as a geographical entity but rather as a site of human-environmental dynamics and political struggles that produce and reproduce the urban landscape.

Nik Heynen’s (2006) work on urban hunger is particularly relevant to urban food security research as it illustrates that hunger is both a natural biochemical process and a social process forged by power relations that determine who eats what and how much and who goes hungry. Humans meet their material need for food by appropriating nature. Their ability to do so, however, depends on the physical, social, political and economic environment which spans from the local to the global scale (Heynen, 2006). Although food is an essential natural resource for human metabolism, access to food is largely beyond individual and community control especially in societies where food is viewed as a commodity for purchase rather than a fundamental human right. Unequal food access therefore is representative of urban inequality generally or inequality within the urban food systems more specifically (Heynen, 2006). Thus, people’s food quality, quantity and dietary diversity is determined by their place in the economy and

institutional structure. Using urban political ecology approaches in the analysis of urban diets in Gaborone necessitates detailed assessment and historical analysis of how and why political-economic structures, social-cultural norms, and ecological systems shape household dietary diversity. The HDDS results presented above can benefit from further explanation on why certain subgroups have less diverse diets and are food insecure. This in turn presents an opportunity to develop appropriate policy, blending household observation within broader scale dynamics.

Political ecology of Gaborone

Political and economic structure influences dietary diversity scores in Gaborone as it shapes the types of foodstuff available, the ease of access to these foodstuffs and to some extent the utilization of these foodstuffs. Key informant interviews revealed that, in terms of food availability, the government of Botswana prioritises the mining industry over other industries, including agriculture, leading to a high dependence on food imports from South Africa. Government and private investments in agriculture generally have been aimed at beef production for export to the European market leaving crop production wanting. Furthermore, the government measures food availability in terms of cereal availability. Cereals (especially maize and sorghum) are therefore affordable and a component of the HDDS of all households surveyed as cereal cost then to be lower than other foodstuffs, in a market system that is not stratified for varying socioeconomic status. There are no niche markets for low income urbanites and prices are not negotiable across the board within supermarkets, cash-and-carry, general provision stores, or street hawkers. Thus, income or access to cash employment is a major determinant of people dietary diversity and food security. Power and control over the urban food system is in the hands of food retailers and distributor as well as the policy makers who decide which foodstuffs are subsidized and what measures are taken to improve access.

In terms of food utilization, while the government of Botswana subsidises access to clean water and medical care, electricity for refrigeration and cooking and cooking gas (propane) are expensive making food storage and preparation a challenge for many low income urbanites. For example, 14 out of 20 low income households involved in this study had no access to electricity while the other 6 reported often going without electricity. The high costs of energy (propane or electricity) for cooking causes

households to often abstain from what they claim are nutritious, traditional Batswana meals, including beef *seswaa* (pounded meat), *setampa* (samp –cracked/husked maize kernels) and *dikgope* (samp and beans). These generally take a long time to cook. The cost of cooking energy is reflected in the low count of pulses/legumes/nuts in the makeup of HDDS, although they remained a valuable part of the popular traditional cuisine in Botswana. Thus, HDDS can be understood as the outcome of political and economic structures beyond yet manifested at the household level.

Social-cultural structure influences dietary diversity scores in Gaborone given that people generally have emotional and symbolic attachments to their food and seek complex means of sustaining or modifying diet within existing societal structures. In the case of Botswana, there is strong attachment to traditional meat based diet such that low income households in Gaborone will substitute costly, high quality meat from grocery stores or butcher shops with affordable animal products, including chicken feet, offal, rather than going without. While HDDS reflects the popularity of meat in Gaborone, it does not offer an explanation as to why meat is popular and how people are seeking substitutes to their preferred diet. The popularity of a meat-based diet in Botswana is a traditional not a contemporary trend of urbanisation and globalisation led increase in high protein consumption. Contemporary urban trends include shifts to high consumption of oil and sugar as they are readily available through imports on grocery store shelves and have become important components of the food basket of all the households studied. Within most of the Gaborone households studied with a dietary diversity score of 4, oil, sugar, and cereal were combined with any other food group. As one respondent puts it, “...we always have the basic food in the house, oil, sugar and maize meal, if we do not have any *morogo* (vegetable) or meat we can just make *motogo* (soft maize meal porridge) with sugar and eat and that fills the stomach...” Given that there is no traditional Batswana replacement to oil and sugar, one can rightly conclude, as several respondents did, that these are foodstuffs that people grow accustomed to while living in the city.

The modern foodscape in Gaborone provides many fast food chains, restaurants, and street food vendors to satisfy the modern eating-out lifestyle, which many Batswana seek. There was repeated reference to the fact that beyond the convenience of eating out, urban dwellers want to be seen eating at certain locations as it is prestigious; others eat out to avoid incurring the cost of feeding other household members with whom they share no direct family relationship. Because urban residents

practice less food-sharing, an important safety net, the urban food insecure and destitute have to rely on government sponsored social programs, which have very strict criteria to assess potential beneficiaries. The government provides beneficiaries with a coupon to make food purchases or a food basket consisting of maize meal, sorghum meal, bread flour, white sugar, beans, cooking oil, beef, iodised salt, pre-packaged soup, baking powder, matches, milk and tea. As people seek to obtain food from similar outlets such as specific grocery stores, fast food, street vendors, and restaurants, their HDDS as the analysis shows is bound to be determined largely by how much income they have to buy food. Also, this results in the noticeable similarity of food groups consumed within all strata of the sample. While the above analysis presents low income households as the losers within the urban food system in Gaborone, these actors have ingenious ways of resisting and exercise agency amidst this material inequality. This agency can be seen in coping strategies such as the diversification of household income sources whereby household own and operate a roadside business while the household head holds a regular job. Agency can also be seen in the use of *motshelo* or “money groups”, which involves groups of women coming together to make regular monthly contributions (savings), which members can lend at a low interest rate. The entire capital and interest are then redistributed at the end of the year in cash or as bulk supply of food/household basic items. These strategies enhance food access through increase access to cash.

The impact of seasons quickly comes to mind when discussing the influence of the ecological system on dietary diversity scores. In Gaborone, people highly depend on grocery stores, which source more than 80 per cent of their stock from South Africa. The Republic of South Africa takes advantage of its diverse and well developed agricultural systems to bridge seasonality, supplying grocery stores in Botswana adequate variety of foodstuffs all year round. All households in the case study noted that they do not experience seasonal food shortages or seasonal variation in diets on account of this. Some households obtain food from rural remittances, particularly during the harvest season (melon, maize, beans) March to May or during the mopane worm season in November to December and in February to March. It is worth noting that food remittances supplement rather than substitute the normal diet and food stuffs that these urban households acquire from supermarkets.

It is also worth highlighting that ecological and cultural factors blend to influence the frequency of occurrence of certain foodstuff as a component of HDDS. For example, ecological conditions in Botswana favour animal rearing and production

of maize and sorghum, thus influencing the high consumption of meat and cereal. Also, low consumption of fish in Botswana, with largely foreigners and Batswana from the Eastern region bordering Zimbabwe eating fish, is understandable given the semi-arid landlocked environment. Most often ecological factors, including aridity and low rainfall, are blamed for low agricultural production and thus limited interest in crop production. Such environmental narratives should not be served as an excuse to direct investment toward other structures or industries, as its impact could be socially detrimental. For example, this environmental narrative contributes to mass migration to Gaborone of people without essential skills to enter the job market. Also it has been noted that the middle income currently benefit from the socio-political system as well at the material and environmental resources that drive productive urban food production in Gaborone (Hovorka, 2004). As such low income households in Gaborone cannot necessarily count on exploiting the physical environment to enhance food security in the city. These tensions and other potential impacts should be considered to produce political and economic policies that are socially and environmentally just. This political ecology analysis has presented useful details to complement the HDDS results and to improve our understanding of the multifaceted and interrelated processes that drive uneven food access in Gaborone.

Conclusion

This paper engages with an urgent development issue, namely urban food insecurity, by exploring the potential of complementing household dietary diversity scores with a political ecology approach to establish a robust and appropriate tool for food security assessment. Dietary diversity can play an important role in monitoring changes within a population and in evaluating the impact of interventions and policies. The result from statistical analysis of household dietary diversity score in Gaborone in the study carried out by the African Food Security Urban Network indicates that there is a positive significant association between dietary diversity and household income (Acquah, 2010). This study arrives at the same conclusions whereby households with high dietary diversity scores (above the mean of 7) tend to have more income to ensure better access to a wide range of food stuffs which will include more non-staples (e.g. potatoes, fruits, eggs). However, in addition, we have illustrated that income level is only one factor amidst the complex, interrelated political-economic, social-cultural, and

ecological processes that shape uneven food access and varying dietary scores in Gaborone.

Using political ecology to interpret dietary diversity scores presents an opportunity to assess more thoroughly the profile of the food-insecure. City dwellers in Gaborone like many parts of the world usually rely on markets for food, including basic staples, which are usually imported, rather than being grown locally. Though food is available in Gaborone, largely through foreign imports, households need income from cash employment to purchase essential foodstuffs. Due to rapid urbanization and migration to the Gaborone area, employment opportunities to improve income are low while alternative safety nets are difficult to access. In other Sub-Saharan African countries, the popular solution is usually to grow more, however, political-economic and ecological factors limit agriculture potential within Botswana. These constraints push urban dwellers to consume processed foods, rich in fats and sugar and low in essential nutrients, which could lead to an increase occurrence of obesity, diabetes, and other chronic conditions amongst the urban poor. The HDDS measure enriched with political ecology analysis provides better understanding of household food access. HDDS exposes the levels of dietary diversity and the food group that constitute the varying levels, while a political ecology approach helps explains why and how households come to lack access to certain food groups as identified by their HDDS. Integrating political ecology to complement HDDS analysis specifically and other standardized quantitative food security measure generally will certainly contribute towards establishing a global standard for food security.

This study suggests that food security policy should go beyond concerns around food supply and agricultural production discussions into questioning what shapes the availability and accessibility of the foodstuffs that make up household daily food baskets. For example, although Botswana's urban food relief scheme for the destitute has shifted from providing a fixed set of food items to providing coupons, which can be used to purchase food, some recipients noted that they can only purchase specific food types (e.g. maize meal, sorghum meal, meat, oil, sugar) under the scheme. Thus, their dietary quality has hardly improved. An increase accessibility of beef, fruits, vegetables, and potatoes will be a welcome relief to many households. Beyond food specifically there is need for electricity and cooking fuel to be more accessible to low income households to facilitate food utilization. These political actions can be further enhanced by analysis from studies that complement quantitative food security measures with

approaches such as political ecology, to provide a nuance understanding the multifaceted and dynamic factors that shape people's food experiences in Botswana, and Africa more broadly.

Acknowledgments

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Appendix

Appendix A: Household Dietary Diversity Score Survey

HOUSEHOLD DIETARY DIVERSITY SCORE (HDDS)		
<p>Now I would like to ask you about the types of foods that you or anyone else in your household ate yesterday during the day and at night. (Read the list of foods. Circle yes in the box if anyone in the household ate the food in question, circle no if no one in the household ate the food)</p>		
Types of food	Yes	No
a. Any (INSERT ANY LOCAL FOODS), bread, rice noodles, biscuits or any other foods made from millet, sorghum, maize, rice, wheat, or (INSERT ANY OTHER LOCALLY AVAILABLE GRAIN)?	1	0
b. Any potatoes, yams, manioc, cassava or any other foods made from roots or tubers?	1	0
c. Any vegetables?	1	0
d. Any fruits?	1	0
e. Any beef, pork, lamb, goat, rabbit, wild game, chicken, duck, other birds, liver, kidney, heart, or other organ meats?	1	0
f. Any eggs?	1	0
g. Any fresh or dried fish or shellfish?	1	0
h. Any foods made from beans, peas, lentils, or nuts?	1	0
i. Any cheese, yoghurt, milk or other milk products?	1	0
j. Any foods made with oil, fat, or butter?	1	0
k. Any sugar or honey?	1	0
l. Any other foods, such as condiments, coffee, tea?	1	0